ARCCA INCORPORATED

TIMOTHY G. JOGANICH, M.S., C.H.F.P.

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Mr. Joganich holds a Bachelor of Science degree in Mechanical Engineering and a Masters degree in Exercise Science, with an emphasis in biomechanics. He is a Certified Human Factors Professional (CHFP). Mr. Joganich has over 25 years of experience in the sciences of human movement, biomechanics, and human factors. He applies his expertise from these areas to product safety (hazard analysis, guarding, warnings/instructions); slip, trip and falls; occupant kinematics; occupant crash protection; egress/ingress; and biomechanical injury analysis. Mr. Joganich has published in the areas of human factors, injury biomechanics, slip resistance and occupant crash protection. He is a member of a number of professional societies.

Mr. Joganich also specializes in the analysis of bicycle accidents with his extensive cycling experience. He has over 30 years of cycling experience including competitive racing, touring, fitness/recreational riding, commuting, and coaching. He is a League Certified Instructor for bicycle safety through the League of American Bicyclists.

SUMMARY OF EXPERIENCE

- Analyzes slip, trip and fall mishaps utilizing expertise in codes, human factors and biomechanics
- Conducts biomechanical injury analysis
- Analyzes occupant kinematics and the design and performance of occupant protection systems
- Analyzes bicycle mishaps. Analysis includes reconstruction, rider behavior, component failure, bicycle maintenance, helmet issues, and rider/bicycle interface
- Performs human factor evaluations of products and software
- Conducts safety analysis of products

AREAS OF SPECIALTY

- Slip & Fall
- Ingress/Egress
- Occupant Kinematics/ Protection
- Ladder Falls
- Bicycle Helmets
- Human Factors
- Biomechanical Injury Analysis
- Biomechanical Human Movement Analysis
- Ergonomics
- Bicycle Accidents & Reconstruction
- Bicycle Product Safety
- Product Safety

EDUCATION

- M.S. Exercise Science with emphasis in Biomechanics, Arizona State University, 1991
- B.S. Mechanical Engineering, Arizona State University, 1981

PROFESSIONAL EXPERIENCE

1997 – Present | ARCCA, Incorporated | Human Factors/Bicycle Expert, Biomechanist

- Analyzes injury mechanisms and occupant kinematics
- Analysis of occupant crash protection systems as it relates to crashworthiness
- Analysis of product safety: machine guarding, warnings/instructions, codes/standards
- Evaluates slip, trip and fall mishaps including slip resistance testing of walkway surfaces
- Performs analysis of building codes associated with personal injuries and premise liability
- Participates in the design and testing of occupant restraint and seating systems for occupant safety and human factors/ergonomic issues
- Human factors evaluation of products/product safety
- Analyzes ingress and egress issues
- Provides instruction in the area of slip/trip/fall analysis, human factors, biomechanical and injury causation analysis

September 1996 – May 1997 | Analytica Systems International | Project Engineer

- Provided consulting services in areas of ergonomics, biomechanics, human factors, occupational safety, product design, product safety, and slip and fall accidents
- Focused on increasing employee productivity while decreasing costs associated with occupational injuries

March 1996 – September 1996 | WYKO | Human Factors Specialist

- Implemented and directed human factors and ergonomic activities related to the design and development of optical instrumentation
- Focused on increasing productivity and minimizing occupational injuries
- Managed various activities, including software interface and product design, product evaluations to ensure compliance with pertinent ergonomic safety standards, and generation of on-line help documentation and other technical documentation
- Conducted usability evaluations of equipment and software

January 1994 – November 1995 | Arizona Movement and Balance Laboratory, HealthSouth Rehabilitation Institute of Tucson | Biomechanist

- Instituted and operated multidisciplinary biomechanics motion analysis laboratory
- Participated in biomechanical research in cooperation with the University of Arizona
- Researched neurological movement disorders, orthopedics, orthopedic and ergonomic product development and rehabilitation. Research activities included generation of research proposals, experimental design, statistical analysis, data acquisition system design and software development
- Secured and managed contract for orthopedic product testing

October 1991 – March 1993 | Orthopedic Biomechanics Institute, Orthopedic Specialty Hospital | Research Project Engineer/Biomechanist

- Conducted biomechanical/gait analysis research studies in the causation, prevention and treatment of sport, occupational and orthopedic related injuries
- Generated proposals
- Performed experimental design, statistical analysis, data collection, data acquisition system design and software development

1984 – 1988 | Garrett Turbine Engine Company | Instrumentation Engineer

- Controlled instrumentation in the design and development of gas turbine engines
- Ensured instrumentation and data met quality standards

PROFESSIONAL AFFILIATIONS

- Human Factors and Ergonomic Society (HFES)
  - Director, Delaware Valley Chapter (2007-2010)
  - President, Delaware Valley Chapter (2005-2006)
  - Program Chair, Delaware Valley Chapter (2000-2005)
  - Executive Director, Arizona Chapter (1996)
- ASTM (American Society of Testing and Materials)
  - F13 Committee on Pedestrian/Walkway Safety and Footwear
  - F08 Sports Equipment and Facilities- F08.10 Bicycle Subcommittee
- American Society of Safety Professionals (ASSP)
- International Code Council (ICC) Member
- Society of Automotive Engineers (SAE)
- League of American Bicyclists

CERTIFICATIONS AND TRAINING

- Certified Human Factors Professional, BCPE, 2003
- Pedestrian/Bicycle Crash Investigation, Institute of Police Technology and Management, University of North Florida. October 2006
- LCI (League Certified Instructor), League of American Bicyclist, July 2005
- Engineer in Training (E.I.T.) State of Arizona
- League of American Bicyclist, Road I course, June 2005
- IBC Solving Means of Egress Issues in Commercial Buildings, 2003
- Symposium on Metrology of Pedestrian Locomotion and Slip Resistance, Conshohocken, PA June 2001
- Overview of the 2000 International Building Code Seminar, Wilmington, DE May 2001
- Ergonomics Job Analysis, Sponsored by University of Michigan, San Diego, CA 1995

- Quality Improvement, Tucson Medical Center, Tucson, AZ. 1994.
- Ergonomics, Rocky Mountain Center for Occupational and Environmental Health, Park City, UT 1993.
- Ergonomics (graduate course work for non-credit), University of Utah. 1993
- Boom & Scissor Lift Training Course, Diamond Tool, Philadelphia, PA February 2009
- Bicycle Assembly & Maintenance Course, Barnett Bicycle Institute, July 2011

PUBLICATIONS

Joganich, T.G., Levitan, A., and Cohen, T.L. (2021) Can Tribometers and Testing Protocols Affect Slip Resistance Values and Opinions? In the Proceedings of the 21st Congress of the International Ergonomics Association (IEA 2021), Vancouver, BC.

Joganich, T., Ingram, A. and Meacham, C. (2020). *GPS Bicycle Computers: The Black Box of Bicycle Accident Reconstruction*. Claims Magazine.

Joganich, T., "A Video-Based System for Measuring the Braking Performance of a Bicycle," SAE Technical Paper 2018-01-5032, 2018, http://doi.org/10.4271/2018-01-5032.

Joganich, T. (Spring 2012). *Accident reconstruction of an unwitnessed bicycle mishap*. Collision, 7(1), 10-19.

Joganich, T. (2009) *Two-Wheeled Trouble Determining Fair Liability in a Bicycle Accident Investigation*, Claims Magazine.

Joganich, T. (2008). *Investigating slip, trip and fall mishaps*. Proceedings of the 2008 ASSE Professional Development Conference. Las Vegas, NV: ASSE.

Joganich, T., Sicher, L., Nicholson, K., Whitman, G., Butch, F. and Nichols, C. (2007). *Human Factors Evaluation of Restraint Systems for Military Vehicles*. Proceedings of the Human Factors and Ergonomics Society, 51st Annual Meeting. October 1-5, Baltimore, Maryland.

Joganich, T. (2006). *Biomechanical Analysis in Slip, Trip, Stumble, and Fall Incidents*. Proceedings of the 2006 ASSE Professional Development Conference. Seattle, WA: ASSE.

Joganich, T. and McCuen, L. (2005). *Influence of groove count on slip resistance using NTL test feet*, Journal of Forensic Science, 50(5), 1141-1146.

Joganich, T.G., Markushewski, M.L., Cantor, A., D'Aulerio, L. et. al. (2000). *Effect of Cognitive Workload on Automatic Restraint Usage*. (2000-01-0174). SAE 2000 World Congress, Detroit, MI.

Joganich, T.G., and Norton, C. (1993). *Kinematic Differences Between Water and Land Gait*, Medicine, Science and Sports Exercise, 25(5), S68.

Joganich, T.G., and Martin, P.E. (1991). *Influence of Orthotics on Lower Extremity Function during Cycling*. Proceedings of American Society of Biomechanics.

Joganich, T.G., Bagley, A.M., Triplet, T., and Paulos, L.E. (1993). *Functional Biomechanical Analysis of the Pilates Reformer during Demi-plie Movements*, Proceedings of International Association of Dance Medicine and Science.

Gushue, D. L., **Joganich, T.**, Probst, B.W., Markushewski, M.L. (2007). *Biomechanics for Risk Managers-Analyses of Slip, Trip & Fall Injuries*. Proceedings of the 2007 ASSE Professional Development Conference. Orlando, FL: ASSE.

Whitman, G., **Joganich, T.**, Dayman, J., Holmberg, B., Gedeon, M. and Reed, J. (2000). *Multimedia Occupant Crash Protection Development Guide and Its Applications to All Modes of Human Transport.* Presented at SAFE, Reno Nevada.

Whitman, G., **Joganich, T.**, Dayman, J., Holmberg, B., Gedeon, M. and Reed, J. (2000). *Multimedia Occupant Crash Protection Development Guide* (2000-01-3427). Presented at SAE Truck and Bus Meeting and Exposition, 21st Century Truck Initiative, Portland, Oregon.

Bagley, A.M., Erickson, A., **Joganich, T.G.**, Greenwald, R., France, P.E. (1992). *Biomechanical Evaluation of Patellofemoral Knee Brace*, Proceedings of Annual Fall Meeting for the Biomedical Engineering Society.

DiDomenico, A., Cohen, T. L., & **Joganich, T.** (2018). Effect of Stair Tread Markings on Foot Placement During Stair Descent. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 62*(1), 865–869.

Gushue, D., Probst, B., Benda B., **T. Joganich**, et al. (2006). *Effects of Velocity and Occupant Sitting Position on the Kinematics and Kinetics of the Lumbar Spine during Simulated Low-Speed Rear Impacts.* Safety 2006, Seattle, WA, ASSE.

Hinrichs, R.N., Thomas, J.R., Martin, P.E., Thomas, K.T., Marzke, M., **Joganich, T.**, DeWitt, J.K., and Sherwood, C.P. (1993). *3-D Analysis of Throwing Patterns of Young Boys and Girls*, Proceedings of the American Society of Biomechanics.

McClean, S., Hindrichs, R., DeWitt, J., Heise, G. Hrelijac, A., **Joganich, T.**, Marsh, T., and Munkasy, B. (1991). *A Comparison of DLT With and Without Extrapolation and NLT 3-D Cinematography Methods*, Proceedings of the American Society of Biomechanics.

Occupant Crash Protection Handbook for Tactical Ground Vehicles (Light, Medium & Heavy). Department of Army, November 2000.

SELECTED PRESENTATIONS AND EDUCATIONAL INSTRUCTION

August 4, 2020 Bicycle Safety. Biking for Vocations, St. Charles Borromeo Seminary

February 16, 2012 *Investigating Slip, Trip and Fall Mishaps*. Suffolk County Bar Association, Long Island, NY

August 2011 *The Anatomy of the Injury, National Worker's Compensation Judiciary College in conjunction with the 66th Annual Worker's Compensation Educational Conference*, Orlando, FL

December 3, 2010 *What Happened at Work? What Do We Do Know* – Forensics, Legal, Medical, Workers Compensation and HR Issues. Greensburg, PA

August 18, 2010 *The Anatomy of the Injury*. The 65th Annual Worker's Compensation Educational Conference and 22nd Safety & Health Conference, Orlando, FL

October 2009	*Investigating Slip, Trip and Fall Mishaps.* ASSE (American Society of Safety Engineers) Virtual Symposium
2006	*Multidimensional approach for investigating slip, trip, and fall accidents.* 2006 ASSE Professional Development Conference, Seattle, WA
September 2006	*Slip, trip and falls: a biomechanical approach.* Annual Meeting of International Association of Special Investigation Units (IASIU), Palm Springs, CA
August 18, 2005	*Slip, Trip and Falls: A New Paradigm.* MetroNorth Transit Authority, New York
July 2004	*Biomechanics of Slip, Trip and Falls.* Invited Lecture Biomechanics 635, Doctorate in Physical Therapy Program, Hahnemann Programs in Rehabilitation Science, Drexel University, Philadelphia, PA
December 2000	*Multimedia Occupant Crash Protection Development Guide.* Presented at SAE Truck and Bus Meeting and Exposition, 21st Century Truck Initiative, Portland, Oregon
October 2000	*Multimedia Occupant Crash Protection Development Guide and Its Applications to All Modes of Human Transport.* Presented at SAFE, Reno Nevada
1997	*Participatory Ergonomics*, Southwest Safety Congress, Phoenix, AZ
1997	*Slips and Falls*, Southern Arizona Chapter of American Industrial Hygiene Association, Tucson, AZ
1997	*Slips and Falls,* Southern Arizona Chapter of American Society of Safety Engineers, Tucson, AZ
1996	*Biomechanics of Ergonomic Injuries,* Ergonomic Express Seminar
1994	*A Motion Analysis Laboratory, AMBL.* Southern Arizona Chapter of the American Physical Therapy Association, Tucson, AZ
1994	*Gait Analysis for Podiatry,* Southern Arizona Chapter of the American Podiatry Association, Tucson, AZ
1994	*Differences in Jaw Kinematics during Speech between a Parkinsonian and a Normal,* Southern Arizona Chapter of Speech and Hearing, Tucson, AZ
1992	*Motion Analysis in Physical Therapy.* Utah Chapter of the American Physical Therapy Association, St. George, UT
1992	*Current Research in Aquatic Therapy,* Advances in Aquatic Therapy, Salt Lake City, UT
1992	*Motion Analysis in Back Care.* 2nd Annual Spine Symposium, Salt Lake City, UT
1992	*Biomechanical Assessment of Skiing,* The Art and Science of Skiing, Salt Lake City, UT

1992 *Biomechanics of Running,* The 5K Run for Research Runners Clinic, Salt Lake City, UT

GRANTS

Joganich, T.G. and Parseghian, M. "A biomechanical and clinical evaluation of a corrective knee brace for medial osteoarthritis. Awarded by OrthoTech, 1995.

Joganich, T.G. and Martin, P.E. "Influence of orthotics on lower extremity function in cycling." Awarded by Nike, Inc. Jan 1990.

Nicholson, D.E., Dibble, L.E., and Joganich, T.G. "Quantitative measures of physical impairment and function: tools for improving the accuracy of documentation, prediction and long-term outcomes, and evaluation of therapeutic efficacy. 1993.

ADDITIONAL CYCLING/ATHLETIC EXPERIENCE

Masters Swim Coach Tempe, AZ

Provided coaching to adult swimmers. Coaching included technique instruction, nutrition, biomechanics, injury assessment and event organization. Provided cycling instruction to triathlons

Bicycle Coach (SomaKinetics) Tempe, AZ
Provided bicycle fitting for proper sizing and adjustments, biomechanical assessment for injury prevention and management and performance enhancement. Conducted training rides focusing effective and safe riding technique

Competitive Swimming: Tempe, AZ
High school, collegiate (Arizona State University) and master swimming

Bicycle Racing

- Seven years racing – USCF (United States Cycling Federation) 1979-1986
- Top ten finishes in Sr I-II Pro category; 4th place Arizona State Championships – 1985

Touring
5,000 mile cycling trek Vancouver, B.C. – Anchorage Alaska – Tempe, AZ, 1982;
Numerous multi-day tours

21st Annual Mountains to Coast Ride - North Carolina Amateur Sports, September 28 to October 5, 2019. Seven (7) days, ~ 450 miles, Blowing Rocks, NC to Atlantic Beach, NC.

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June 30, 2021

Duane J. Ruggier, Esquire
Pullin, Fowler, Flanagan, Brown & Poe, PLLC
901 Quarrier Street
James Mark Building
Charleston, WV 25301-2607

Re: ***Means, William Allen vs. E.M. Peterson, D. Harvey, and The City of South Charlestown.***
ARCCA File No.: 4223-023

Dear Mr. Ruggier:

Thank you for the opportunity to participate with you in the above-referenced matter. You engaged me to analyze the video taken of the incident that involved Mr. William Means. This analysis is based on information currently available to me. I reserve the right to revise or supplement this report if additional information becomes available to me.

The opinions given in this report are based on my analysis of the materials available to me using scientific and engineering methodologies generally accepted in the engineering, human factors, and biomechanical communities. The opinions are also based on my visit to the site, education, background, knowledge, and experience in the fields of safety, building codes, human factors, kinematics, biomechanics, human injury mechanisms and tolerance. I have a Bachelor of Science degree in Mechanical Engineering and a Master of Science in Exercise Science with an emphasis in biomechanics. I am a Certified Human Factors Professional (CHFP). This credential is the same as a Certified Professional Ergonomist, which is more commonly known in the industrial setting. During the course of my career, I have conducted numerous studies and have published articles in the areas of human movement biomechanics, injury biomechanics, slip resistance, and human factors/ergonomics. I am a member of the Human Factors and Ergonomics Society (HFES), American Society of Safety Engineers (ASSE), International Code Council (ICC), Society of Automotive Engineers (SAE), and the American Society for Testing and Materials (ASTM) F13 Committee for Pedestrian/Walkway Safety and Footwear.

MATERIALS REVIEWED:

As part of my analysis in this matter, I reviewed the following materials:

- Amended Complaint, In the United States District Court for the Southern District of West Virginia at Charleston, Civil Action No. 2:20-cv-00561;
- Two minutes twelve seconds (2:12) video of the subject incident;
- Ten (10) second slowed down clip of the subject video;
- Eighteen (18) police accident photographs of the subject scene;
- Deposition transcript of Officer David Harvey, April 26, 2021;
- Deposition transcript of William Means, March 29, 2021;
- Deposition transcript of William Means, April 20, 2021;
- Deposition transcript of Melissa Nunley, April 26, 2021; and

- Deposition transcript of Mary Chandler, April 26, 2021.

In addition to reviewing the above file material, I conducted testing on June 28, 2021.

FINDINGS:

According to the available information, on May 2, 2020 in South Charleston, West Virginia, Mr. William Means, who was riding a motorcycle and being pursued by Officer David Harvey and Corporal Peterson in separate police vehicles came to crash at a railroad crossing on Dartmouth Ashford Road, County Highway 10 right past the Kanawha Boone County Line near Gripple Lane. Mr. Means initially came to rest in a ditch with standing water on the left (or far) side of the railroad track and was then moved onto the opposite side of the railroad tracks. The subject incident then occurred after Officer David Harvey handcuffed Mr. Means while he was on the ground in a prone orientation (face down) and wearing his motorcycle helmet. The amended complaint alleges that Officer Harvey stomped on Mr. Means' "*head.*"

The subject incident was a 2-minutes 12 seconds long video taken with cell phone by a bystander who came upon the scene. (See Figure 1) The video was taken from the inside of a yellow Jeep Wrangler and has the sound of two female voices, Ms. Melissa Nunley and Mary Chandler (Nunley pgs. 9, 13; Chandler pg. 31). Ms. Chandler recorded the video on her cell phone (Chandler pg. 14). The video begins showing a yellow Jeep Wrangler, driven by Ms. Nunley pulling up to the scene, at which point the upper torsos of the two police officers can be seen on the opposite side of the railroad tracks with Mr. Means presumably in the ditch. The Jeep Wrangler comes to a stop, at which point the video zooms in on activity of the police officers, including the time when Mr. Means was moved to the opposite side (i.e. near side) of the railroad tracks, when he was handcuffed, and when the subject incident occurred. The subject incident occurred between 1-minute 29 seconds and 1-minute 31seconds. Ms. Chandler can be heard saying "*they just stomped on his f***king head*" during that time frame (Chandler pg. 31).

Figure 1: Incident video

Officer Harvey testified four times during his deposition that he stepped over Mr. Means' head as opposed to stomping on it (Harvey pgs. 119, 123 and 126). The first time Officer Harvey was asked about stepping and/or stomping, which was prior to the video being played, he was specifically asked if it was his testimony that he did not use his foot to stomp on Mr. Means' head, at which time he testified "*Correct*" (Harvey pg. 119). Officer Harvey was then shown the video after which time he specifically testified that the motion of his leg at 1 minute 31 seconds was him "*…stepping over him* [Mr. Means]" (Harvey pg. 123). When Officer Harvey was asked to confirm that his foot did not come into contact with Mr. Means' head, even though the ladies who were watching said that they saw him stomp on his head, he testified *"Correct. They also saw* [sic] *that we tased him which we didn't have tasers. They've been wrong before"* (Harvey pg. 123). Later during the deposition when Officer Harvey was asked if his foot going up in the air and then down was him stepping over Mr. Means, he testified "*Correct"* (Harvey pg. 126). Officer Harvey also testified that he handcuffed Mr. Means prior to his leg going up in the air (Harvey pg. 127).

My understanding is that Officer Harvey was 5 foot 11 inches in height and 210 pounds in weight at the time.

Mr. Means testified that he didn't remember his head being stomped (Means Vol. 1 pg. 32). When Mr. Means was asked specifically if he felt his head being stomped on, he testified, "*I was out"* (Means Vol. 1 pg. 32). Mr. Means also testified that at the time he was wearing a black full-face DOT approved helmet, which did not have a visor at the time (Means Vol. II pgs. 7-8). For reference purposes, "DOT approved" refers to the federal requirements from the Department of Transportation for labeling motorcycle helmets with "DOT" constituting that the helmet conforms to the applicable Federal motorcycle vehicle safety standards.[1]

Twenty-three (23) screen captures from the slowed down ten (10) second long clip of the incident video were inserted into PowerPoint for frame-by-frame analysis, hereto attached as Appendix A. (See Figure 2) For completeness, this 10-second video was also zoomed in from the original video.

Figure 2: Slide 1 from Power Point with screen captures

[1] CFR Title 40 Section 571.218 Standard No. 218, Motorcycle helmets

The aforementioned screen captures in conjunction with the other provided available file materials provide the basis for the following findings.

Frame 1: Officer Harvey is seen from a posterior view standing on the ground in a perpendicular orientation to Mr. Means' body near its mid-point while bent over in a 90-degree posture. Mr. Means' body is in a prone orientation (face down) with the head towards the right side of the image. Officer Harvey's feet are slightly more than shoulder width apart with his left and right legs in similar if not identical postures.

Frames 1-7: Officer Harvey translates his left foot laterally with little elevation towards his right foot and places it next to this right foot while he maintains his bent over posture and orientation.

Frame 7: Officer Harvey's right and left legs are in similar if not identical postures with both feet on the ground while he maintains his bent over posture.

Frames 7-15: Officer Harvey elevates his right foot and moves it in the forward direction with an upward and forward trajectory as evident by the flexion of his right hip and knee. At the same time, Officer's Harvey's body rotates slightly counterclockwise (top down view) about his left foot while his he maintains his bent over posture. Officer Harvey's right arm is extended downward with his right-hand in contact with Mr. Means in the area of his back.

Frame 15: Officer Harvey's right foot is at its maximum height, which is at approximately the height of his left knee.

Frames 16-20: Officer Harvey's right foot exhibits a downward trajectory to the ground as evident by the extension of his right hip and knee. Officer Harvey's right and left legs are in similar if not identical postures.

Frames 21-22: Officer Harvey's upper torso moves downward by slightly flexing his knees while he maintains his bent over posture.

Frame 22: Officer Harvey's body has moved up towards Mr. Means' head with his body aligned with Mr. Means' body. Officer Harvey's right and left legs are in similar if not identical postures.

My investigation in this manner included conducting human factors testing to assess the kinematics and/or posture during stomping. In doing so, a Bell Qualifier motorcycle helmet (size L) was placed onto the head of a Rescue Randy mannequin, which was positioned in a prone orientation on the floor with load cell positioned underneath the helmet to measure the loading from the stomping.[2,3] While the loading measurements were not specifically required for the true purposes of the tests, they were included in the testing protocol to maintain the test's external validity.[4] In other words, the test subjects were informed that the purpose of the test was to measure the forces, which blinded them of the true purpose of the test, which was to monitor their postures during stomping. Consequently, it was reasoned that the test subjects would assume a posture that would allow them to most forcefully stomp onto the helmet.

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2 Transducer Techiques 20,000 lb load cell. Model LPU-20K, S/N 417985

3 https://www.aedsuperstore.com/simulaids-rescue-randy-manikin-165-lbs-unweighted.html. Accessed June 23, 2021.

4 Thomas, J.R. and Nelson, J.K. (1985) Introduction to research in Health, Physical Education, Recreation and Dance. Human Kinetics.

Three (3) test subjects were utilized during testing and were absent any musculoskeletal and/or medical conditions that would prevented them from participating in the testing using their foot of choice.[5] As previously discussed, the test subjects were informed that the purpose of the testing was to measure the forces when they forcefully stomped on the motorcycle helmet. The test subjects were also instructed to stomp as forcefully as possible onto the motorcycle helmet without any restrictions of their posture including arm and trunk movements. There procedures are consistent with other research that has investigated the kinetics of stomping.[6] The test subjects started from a location approximately 7 feet laterally from the test dummy's waist area. Three (3) trials were conducted for each test subject. Testing was recorded with two standard video cameras to capture the subjects' overall body posture and their relative position to the motorcycle helmet.

Screen captures from trial 2 for each test subject at maximum stomping foot elevation and at foot-helmet contact are presented in Figure 3 for illustrative purposes. These test results unequivocally revealed that after the test subjects approached the test dummy, their stance foot was placed within approximately 15 inches laterally from the center of the motorcycle helmet. The test subjects then elevated their stomping foot while in an upright posture by flexing their hips and knees to a maximum elevation with the upper leg above horizontal and the knee at approximately mid-abdominal level. The test subjects maintained an upright posture throughout the entirety of their stomping. The movements and kinematics of the test subjects seen in Figure 3 were consistent across all the other trials.

Maximum foot height

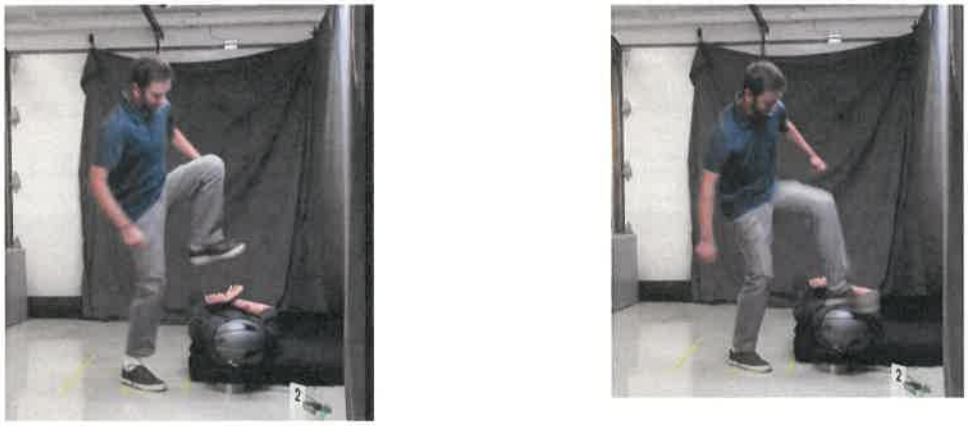
Foot contact

Subject 1

[5] Subject 1: 23 y.o. male, 5 foot 10 inches, 204 lbs.; Subject 2: 21 y.o. male, 6 foot, 179 lbs; Subject 3 24 y.o. male, 5 foot 8 inches, 150 lbs. Heights without footwear, weights with footwear. Subject 1: work boots, subject 2: sneakers and subject 3: causal shoes.

[6] Schirmer, F. et al. (2016). Biomechanical assessment of the injury of risk of stomping. International Journal of Legal Medicine 120, 827-834.

Subject 2



Subject 3

Figure 3: Biomechanical testing

ANALYSIS/DISCUSSION:

My analysis in this matter consisted of conducting an analysis of the incident video in the context of Mr. William Means' incident and the allegation that his head was stomped on by Officer David Harvey. In doing so, my analysis considered the facts of the case in the context of the laws of physics, fundamental principles of human movement biomechanics, human factors, and the methodology for scientific inquiry.[7,8,9,10,11]

The kinematics or body motion exhibited by Officer Harvey in the video unequivocally demonstrate that he was stepping over the motorcycle helmet that Mr. Means was wearing as opposed to stomping on it on several accounts. Initially, Officer Harvey's bent over posture throughout the video screen capture sequence, would not have allowed him to stomp on Mr. Means' motorcycle helmet in a forceful manner. (See Figure 4) If in fact Officer Harvey wanted to forcefully stomp on Mr. Mean's motorcycle helmet, he would have stood near the motorcycle helmet an upright posture similar to what was seen in the human factors testing. From a

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7 Winter, D.A. (1990). Biomechanics and motor control of human movement. John Wiley & Sons, Inc. New York, NY.
8 Sanders, M.S. and McCormick, E.J. (1993). Human factors in engineering and design: Seventh edition, McGraw-Hill, NY.
9 Resnick, R. and Halliday, D. (1977). Physics. John Wiley & Sons, New York.
10 Hay, J.G. and Reid, J.G. (1988). Anatomy, mechanics and human motion. 2nd edition. Prentice-Hall, Inc. Englewood Cliffs, NJ.
11 Cary, S.S. (2004). A Beginner's Guide to Scientific Method. Third Edition. Wadsworth, Belmont, CA.

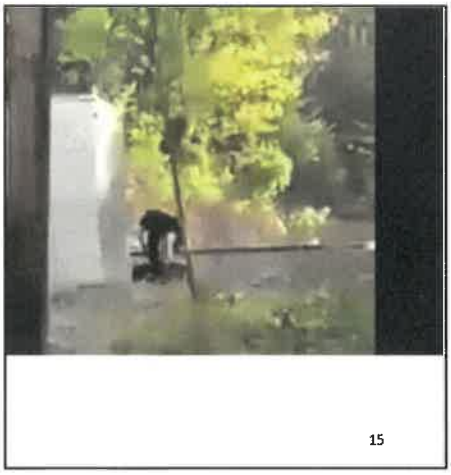
biomechanical perspective, maximizing the stomping forces necessitates standing in an upright posture with the body's center of mass above the point where the force is going to be applied. Standing near Mr. Means' motorcycle helmet he would have allowed Officer Harvey to put his body weight into the stomp. Additionally, standing in an upright posture would have allowed Officer Harvey to maximize the downward velocity of his stomping foot, and hence the contact force with was facilitated by maximally elevating his foot. In contrast, when Officer Harvey was bent over with his right hand on Mr. Means, his center mass would have been shifted forwarded off his feet, which would have positioned his center of mass further from Mr. Means' motorcycle helmet. Additionally, his ability to elevate his stomping foot would be significantly less than if he were bent over given the mere fact that the upper leg would not be able to be elevated above horizontal.

Frame 1

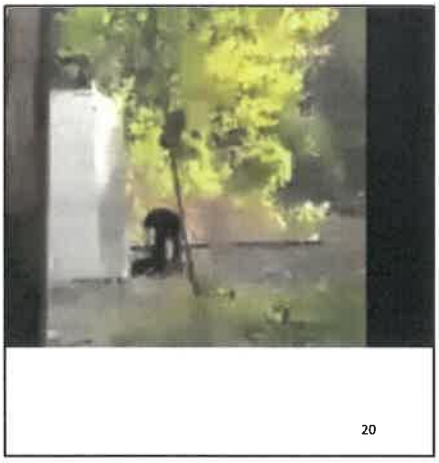
Frame 23

Figure 4: Officer Harvey's beginning and ending posture

In addition, the kinematics of Officer Harvey's right leg and foot are consistent with stepping over Mr. Means, as opposed to stomping on his motorcycle helmet. Officer Harvey's right foot goes from its maximal height in Frame 15 to ground contact in Frame 20 in a continual manner with his right leg achieving full extension. (See Figure 5) If in fact Officer Harvey stomped on the motorcycle helmet of Mr. Means, his right foot would have stopped at some distance above the ground with his hips and knee exhibiting some degree of flexion.



Frame 15



Frame 20

Figure 5: Kinematics of Officer Harvey's right leg/foot

In summary, the kinematics exhibited by Officer Harvey, including that of his right leg and foot, are consistent with him stepping over Mr. Means, as opposed to stomping on his motorcycle helmet. Moreover, the bent over posture that Officer Harvey maintained throughout the sequence would have prevented him from maximally applying any stomping forces to Mr. Means' motorcycle helmet. In the end, Officer Harvey was simply re-orienting himself by stepping over Mr. Means' body.

CONCLUSIONS:

Based on my findings and analysis, I have concluded within a reasonable degree of scientific certainty that:

- The motion exhibited by Officer Harvey in the video is consistent with him stepping over the upper body of Mr. William Means, as opposed to stomping on his motorcycle helmet.

Sincerely,

Timothy Joganich, MS, CHFP
Senior Consultant